

## **2. RESPONSE/REMARKS**

### **2.1 STATUS OF THE CLAIMS**

*Claims 1-5 and 10-20 were pending at the time of the Action.*

*Claims 2-4, and 18-20 have been cancelled herein without prejudice or disclaimer.*

*Claims 1, 5, and 10-17 have been amended herein.*

*Claims 21-26 have been added herein.*

*Claims 1, 5, 10-17, and 21-26 are now pending in the application.*

### **2.2 SUPPORT FOR THE AMENDMENT**

The pending claims are fully supported by the specification and claims as originally filed. It is Applicants' belief that no new matter is introduced by the present amendment.

### **2.3 A SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT IS PROVIDED.**

Applicants enclose herewith a Supplemental Information Disclosure Statement (SIDS), along with the authorization to charge the Deposit Account for the required fee, making additional references of record in the pending Application. Applicants respectfully request that the SIDS be considered, and the Form PTO-1449 initialized by the Examiner in the next subsequent Action as evidence of his consideration of the references cited therein.

### **2.4 A TERMINAL DISCLAIMER MAY BE SUBMITTED TO OVERCOME PROVISIONAL**

#### **REJECTION OF CLAIMS UNDER NON-STATUTORY DOUBLE PATENTING.**

The Examiner has provisionally rejected claims 1-5, 11, 12, and 16-20 as allegedly being patentably indistinct from claims 1 and 11-15 of copending application number 11/420,981 to Petrus.

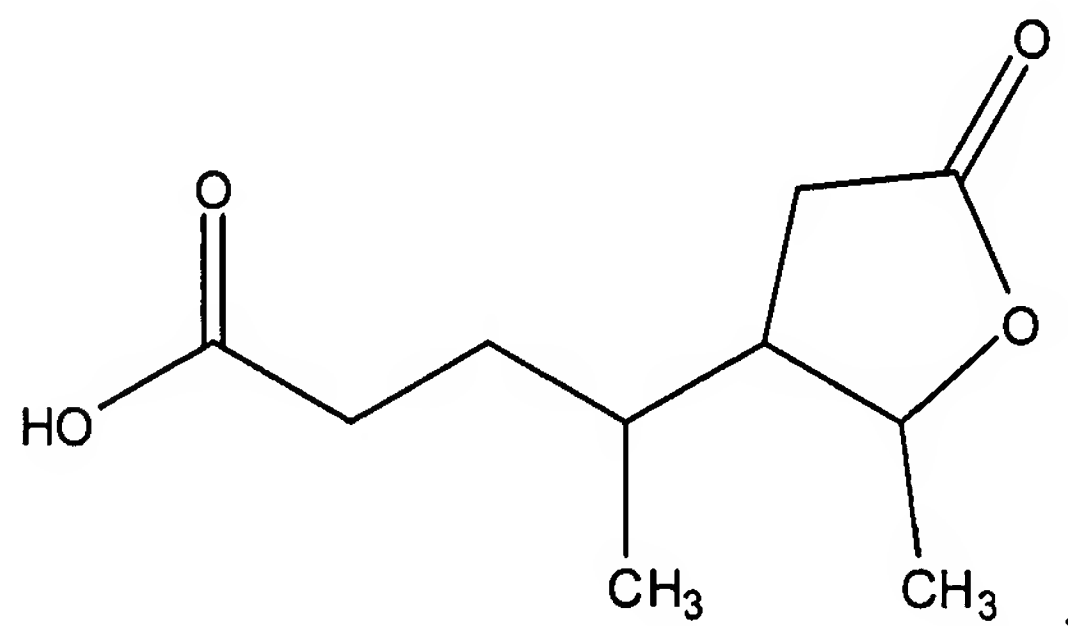
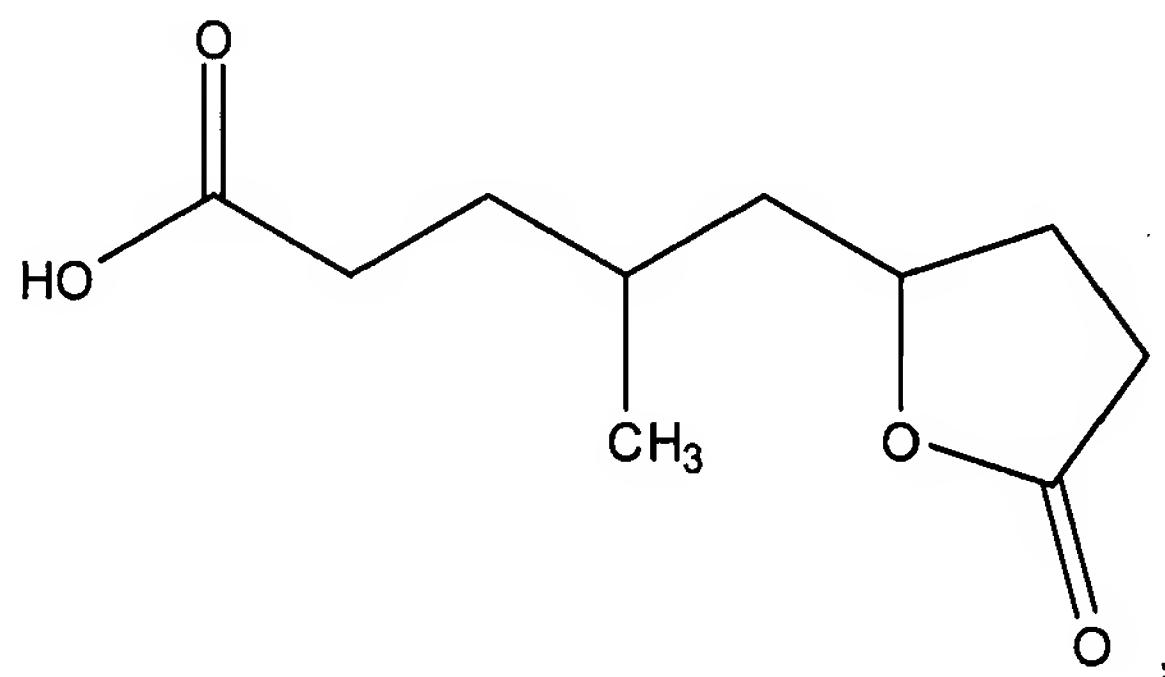
Without acquiescing in any way to the merits of such a provisional rejection, to facilitate expedited prosecution of the pending application, Applicants note that the submission of a terminal disclaimer may be sufficient to overcome this provisional rejection, but elect to defer such a submission until all other claim rejections have been withdrawn.

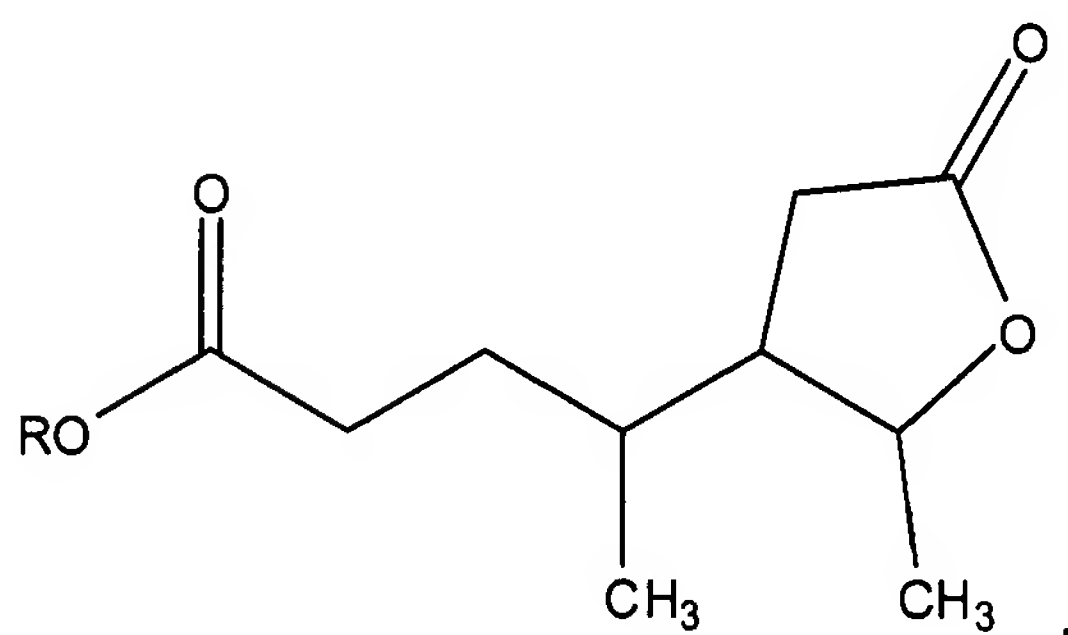
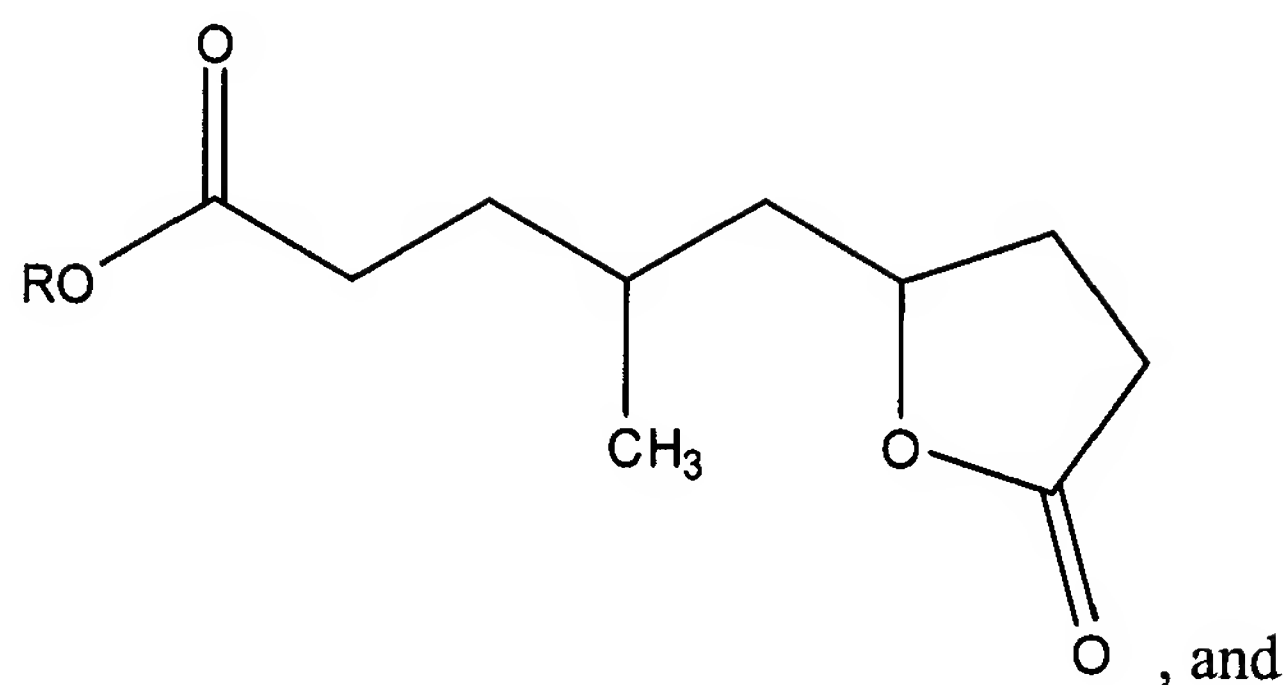
## 2.5 THE REJECTION OF CLAIMS UNDER 35 U.S.C. § 102(B) IS OVERCOME.

*The Action at page 2 rejected claims 1-3, 10-12, 14, and 16-19 under 35 U.S.C. § 102(b), allegedly as being anticipated by EP1036878 to Saya et al. (hereinafter "Saya").*

Applicants respectfully traverse, and assert that for a reference to legally anticipate a claim, *each and every element* of the claim must be taught by the cited reference. The reference by Saya, however, fails in this regard, and as such, cannot anticipate the claimed invention.

Independent claim 1 and new independent claims 24-26 each recite processes using a solvent that comprises a compound according to any one of the formulas



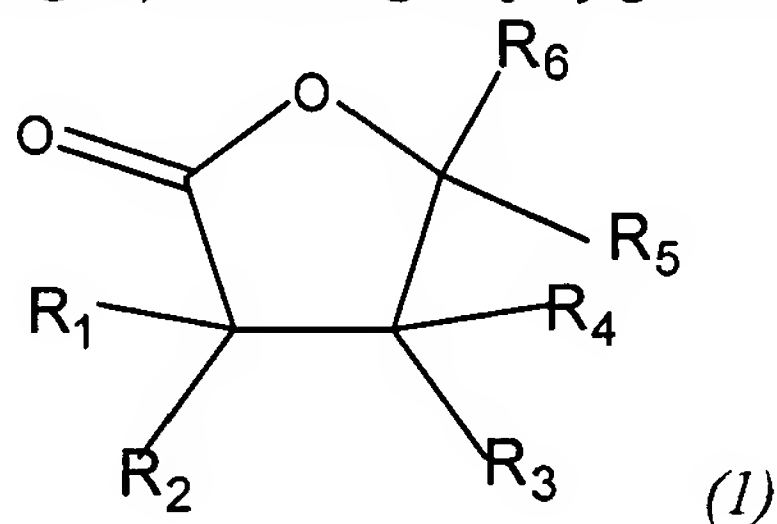


wherein **R** is C<sub>1-10</sub> alkyl.

None of these compounds is taught by Saya. Therefore, Saya cannot anticipate claim 1, nor can it anticipate new independent claims 24-26.

With respect to the remaining independent claims, new claim 21 recites:

*A process for the liquefaction of lignocellulosic or cellulosic material, wherein solid lignocellulosic or cellulosic material is heated at a temperature in the range of from 100 to 300°C in the presence of an acid catalyst and a solvent, wherein the solvent-to-solid material weight ratio is at most 50, the acid catalyst is present in a concentration of at most 50% by weight of acid based on the weight of solvent and acid, and the solvent comprises a compound having a  $\gamma$ -lactone group of general molecular formula:*



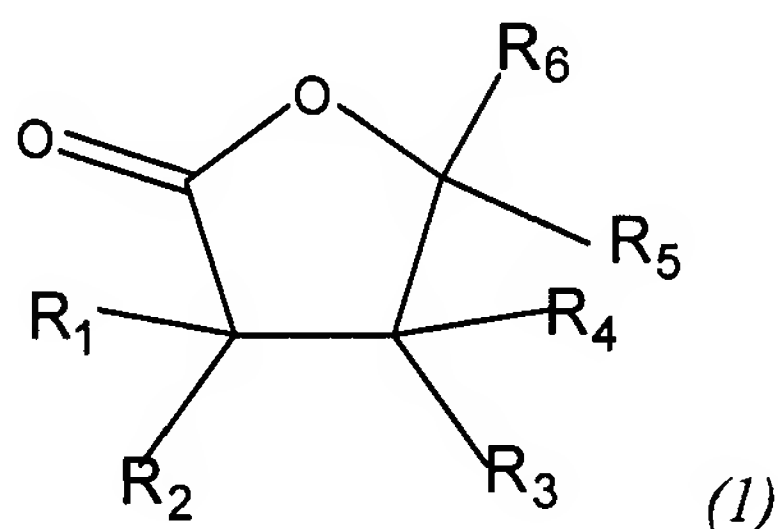
*wherein R<sub>1</sub> to R<sub>6</sub> each represent, independently, a hydrogen atom or an organic group connected with a carbon atom to the lactone group, and*

*further wherein the compound having a  $\gamma$ -lactone group is obtainable from levulinic acid by hydrogenation, dehydration, aldolcondensation, dimerization or oligomerization, esterification with an alcohol, or a combination of two or more of these reactions.*

Because Saya does not teach the limitation “wherein the compound having a  $\gamma$ -lactone group is obtainable from levulinic acid by hydrogenation, dehydration, aldolcondensation, dimerization or oligomerization, esterification with an alcohol, or a combination of two or more of these reactions,” Saya cannot anticipate new claim 21.

Similarly, new claim 23 recites:

*A process for the liquefaction of lignocellulosic or cellulosic material, wherein solid lignocellulosic or cellulosic material is heated at a temperature in the range of from 100 to 300°C in the presence of an acid catalyst and a solvent, the acid catalyst is present in a concentration of at most 50% by weight of acid based on the weight of solvent and acid, and the solvent comprises a compound having a  $\gamma$ -lactone group of the general molecular formula:*



*wherein  $R_1$  to  $R_6$  each represent, independently, a hydrogen atom or an organic group connected with a carbon atom to the lactone group, and further wherein the solvent-to-solid material weight ratio is in the range of from 3 to 20.*

Because Saya does not teach the limitation “wherein the solvent-to-solid material weight ratio is in the range of from 3 to 20,” it also does not anticipate new claim 23.

Applicants respectfully request, therefore, that the novelty rejection over Saya be withdrawn.

**2.6 THE REJECTION OF CLAIMS UNDER 35 U.S.C. § 103(A) IS OVERCOME.**

*The Action at page 3 rejected claim 13 under 35 U.S.C. § 103(a), allegedly as being legally obvious over Saya in view of U.S. Patent 3,968,294 to Robitschek et al. (hereinafter “Robitschek”).*

*Saya is said to teach the use of organic acids as a catalyst in a method for liquefying paper/cellulose comprising heating lignocellulosic material to a temperature of 100 to 200°C in the presence of an acid catalyst and valerolactone as a solvent (Action page 2). The Action notes on page 3, however, that Saya does not disclose the use of any of the acids recited in instant claim 13. However, because Robitschek is said to disclose the use of maleic acid as a catalyst, the Office considers that it would have been obvious to one of ordinary skill in the art to have used the maleic acid of Robitschek as the catalyst in the process disclosed in Saya.*

Applicants respectfully traverse.

*The Action at page 4 also rejected claim 15 under 35 U.S.C. § 103(a), allegedly as being obvious in view of Saya.*

*Saya is said to teach a process for liquefying lignocellulose wherein the solvent is present in a weight ratio with the lignocellulose of 0.5 to 3 (Action page 4). Because the ratio of 0.5 to 3 allegedly overlaps with the claimed ratio of 3 to 20 in claim 15, the Office considers that it would have been obvious to one of ordinary skill in the art to have used the “high end of the disclosed range” in the Saya process in the methods claimed in the above-captioned application.*

Again, Applicants respectfully traverse.

The Supreme Court has repeatedly concluded that a finding of obviousness is a question of law based on “underlying factual inquiries.” The relevant factors to be considered were set forth over forty years ago in *Graham v. John Deere Co.* (383 U.S. 1, 148 USPQ 459, 1966) as follows: (a) determining the scope and content of the prior art; (b) ascertaining the differences between the claimed invention and the prior art; and (c) resolving the level of ordinary skill in the pertinent art.

These same *Graham* factors have also been applied in *each* of the Supreme Court’s subsequent decisions regarding obviousness, including the widely-publicized *KSR International Co. v. Teleflex Inc.* [See, e.g., *United States v. Adams*, 383 U.S. 39, 51–52, 148 USPQ 479, 483 (1966); *Sakraida v. AG Pro, Inc.*, 425 U.S. 273, 189 USPQ 449, reh’g denied, 426 U.S. 955 (1976); *Dann v. Johnston*, 425 U.S. 219, 189 USPQ 257 (1976); *Anderson’s-Black Rock, Inc. v. Pavement Salvage Co.*, 396 U.S. 57, 163 USPQ 673 (1969) and *KSR International Co. v. Teleflex Inc.*, 550 U.S. \_\_\_, 82 USPQ2d 1385 (2007)]<sup>1</sup>.

In *KSR*, the Supreme Court concluded that the district court had correctly determined that the patent-in-suit was invalid as obvious, and that the Federal Circuit had erred in its decision (*Teleflex Inc. v. KSR Int’l Co.*, 119 Fed. Appx. 282, 288 [Fed. Cir. 2005]) overturning the lower court’s finding by applying its longstanding “teaching-suggestion-motivation (“TSM”) test” in an “overly rigid and formalistic way.”

---

<sup>1</sup>“In *United States v. Adams*, [t]he Court recognized that when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result. In *Anderson’s-Black Rock, Inc. v. Pavement Salvage Co.*, [t]he two [pre-existing elements] in combination did no more than they would in separate, sequential operation. [I]n *Sakraida v. AG Pro, Inc.*, the Court derived the conclusion that when a patent simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious.” (*Id.* p. 57527; internal quotations omitted).



In *KSR*, the Supreme Court reaffirmed the familiar framework for determining obviousness as set forth in *Graham* based on its precedent that “[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” The Supreme Court further stated that:

*[w]hen a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, 35 U. S. C. § 103 bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.*

When considering obviousness of a combination of known elements, the operative question is thus “whether the improvement is more than the predictable use of prior art elements according to their established functions.”

Following the decision in *KSR*, the Office published revised examination guidelines on October 10, 2007 [Fed. Reg. **72(195)**:57526-57535] to assist Examiners in determining obviousness under 35 U.S.C. § 103 in view of the Supreme Court’s latest decision. The revised guidelines note that when resolving the *Graham* inquiries,

*[i]t must be remembered that while the ultimate determination of obviousness is a legal conclusion, the underlying Graham inquiries are factual. When making an obviousness rejection, Office personnel must therefore ensure that the written record includes findings of fact concerning the state of the art and the teachings of the references applied. In certain circumstances, it may also be important to include explicit findings as to how a person of ordinary skill would have understood prior art teachings, or what a person of ordinary skill would have known or could have done. Factual findings made by Office personnel are the necessary underpinnings to establish obviousness.*

*In short, the focus when making a determination of obviousness should be on what a person of ordinary skill in the pertinent art would have known at the time of the invention, and on what such a person would have reasonably expected to have been able to do in view of that knowledge. This is so regardless of whether the*

*source of that knowledge and ability was documentary prior art, general knowledge in the art, or common sense.*

In *KSR Int'l. Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1739 (2007), the Court stated that:

a patent composed of several elements *is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.* Although common sense directs one to look with care at a patent application that claims as innovation the combination of two known devices according to their established functions, it can be important ***to identify a reason*** *that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.* This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known. *Id.* at 1741 (emphasis added).

As the PTO recognizes in M.P.E.P. § 2142:

*[T]he examiner bears the initial burden of factually supporting any prima facie conclusion of obviousness. If the examiner does not produce a prima facie case, the applicant is under no obligation to submit evidence of non-obviousness....*

If, however, the Examiner does produce a *prima facie* case, the burden of coming forward with evidence or arguments shifts to the applicant who may submit additional evidence of non-obviousness, showing that the claimed invention possesses improved properties not expected by the prior art. The initial evaluation of *prima facie* obviousness thus relieves both the Examiner and applicant from evaluating evidence beyond the prior art and the evidence in the specification as filed until the art has been shown to suggest the claimed invention:



*To reach a proper determination under 35 U.S.C. § 103, the Examiner must step backward in time and into the shoes worn by the hypothetical “person of ordinary skill in the art” when the invention was unknown and just before it was made. In view of all factual information, the Examiner must then make a determination whether the claimed invention as a whole would have been obvious at that time to that person. Knowledge of Applicant's disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the “differences,” conduct the search and evaluate the “subject matter as a whole” of the invention. The tendency to resort to hindsight based upon Applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art (emphasis added).*

*The ultimate determination of patentability is based on the entire record, by a preponderance of evidence, with due consideration to the persuasiveness of any arguments and any secondary evidence. In re Oetiker, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). The legal standard of “a preponderance of evidence” requires the evidence to be more convincing than the evidence which is offered in opposition to it. With regard to rejections under 35 U. S. C. § 103, the Examiner must provide evidence which as a whole shows that the legal determination sought to be proved (i.e., the reference teachings establish a prima facie case of obviousness) is more probable than not (emphasis added).*

In the present application, Applicant respectfully asserts that the legal standard required for sustaining a rejection of claims 13 and 15 for obviousness as a matter of law has not been met. Moreover, Applicant believes that the cited references fail to obviate the claimed invention based upon matters of fact.

M.P.E.P. § 2143.01(III) states that “the mere fact that references *can be combined* does not render the resultant combination obvious *unless the results would have been predictable* to one of ordinary skill in the art” (emphasis added). In the present case, the Office has not provided any evidence or clear reasoning why combining the disclosure of Saya with that of Robitschek would present a predictable result, or render the *claimed* invention legally obvious.

The Office has not shown how it would have been obvious to one of ordinary skill in the art that the combined disclosures of Saya and Robitschek would have provided a *predictable* result in obtaining the *claimed* invention, namely the process set forth in claim 13. The Office only concludes that the acid catalyst disclosed in Robitschek could be obviously substituted in the process taught in Saya to render original claim 13 obvious, not that such a combination could in some fashion be extrapolated so as to make the presently-claimed invention obvious to one of ordinary skill in the art.

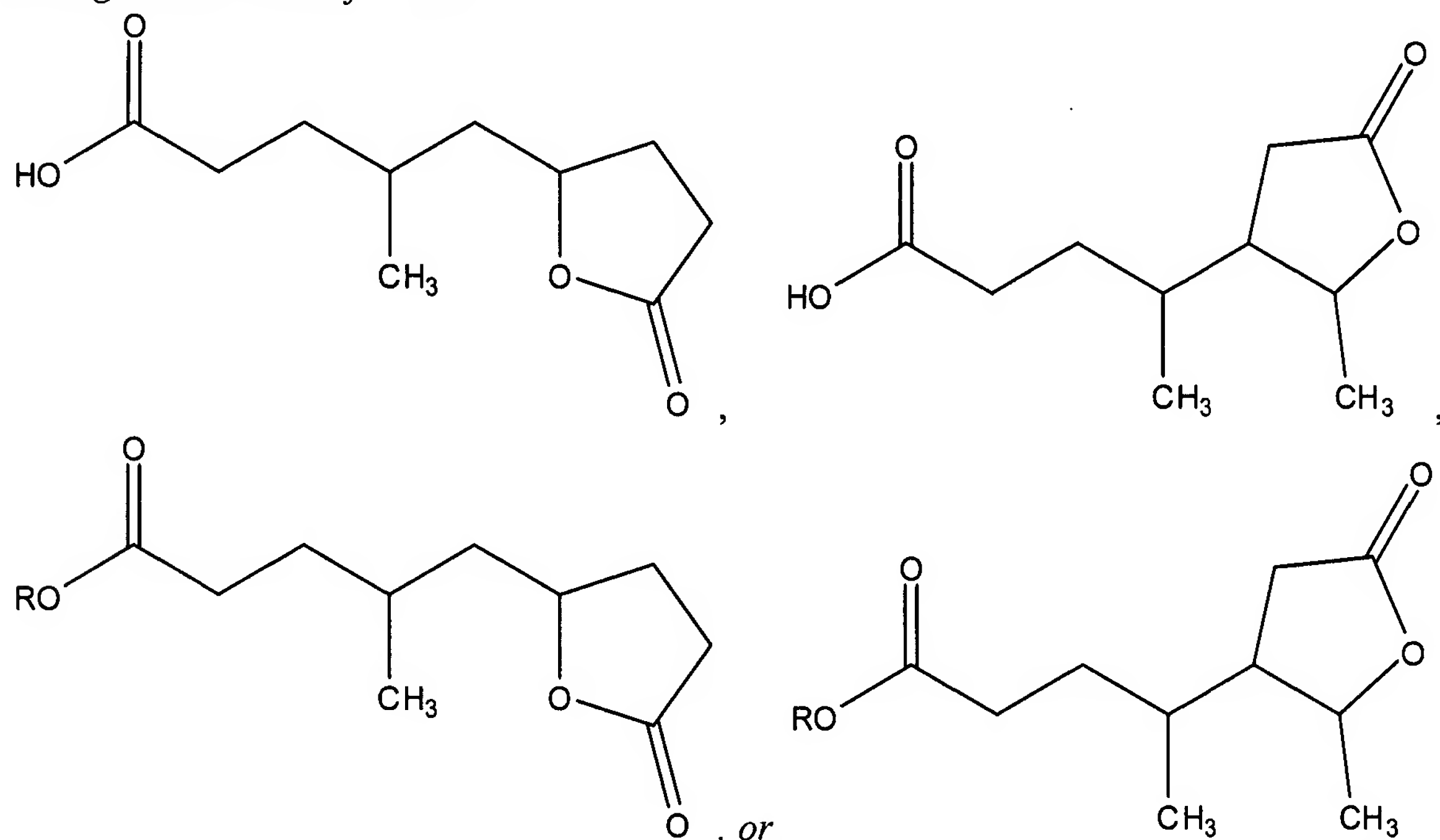
Moreover, the Office has not shown how the substitution of an acid catalyst taught in Robitschek in the process of Saya would have caused one of ordinary skill in the art to achieve the process claimed in instant claims 13 predictably and without any further improvement, assessment, development or experimentation. For this reason alone, the Examiner's burden of factually supporting a *prima facie* case of obviousness has not been met, and as such the rejection under 35 U.S.C. § 103(a) of claim 13 over Saya in view of Robitschek should be withdrawn.

Moreover, the Office has mistakenly concluded that one of ordinary skill would have done so ***not only with the expectation of success, but also with an ability to predict the outcome of the invention***. The Office thus mistakenly concludes that the process in claim 13 would have been *prima facie* obvious to a person of ordinary skill at the time the invention was made to achieve the claimed invention by substituting the acid catalyst of Robitschek in the process of Saya.

In response to this rejection, Applicant respectfully disagrees, and traverses the rejection. Applicant believes that the Office is using the impermissible benefit of hindsight reconstruction, selectively choosing excerpts from the cited reference to advance rejection of various pending claims based upon legal obviousness using Saya alone (to reject claim 15), or in combination with Robitschek (to reject claim 13).

Claim 13, if re-written in proper independent format to incorporate the limitations of claim 1 and the intervening claims from which it depends, would recite:

*A process for the liquefaction of lignocellulosic or cellulosic material, wherein solid lignocellulosic or cellulosic material is heated at a temperature in the range of from 100 to 300°C in the presence of an acid catalyst and a solvent, wherein the solvent-to-solid material weight ratio is at most 50, the acid catalyst is present in a concentration of at most 50% by weight of acid based on the weight of solvent and acid, and the solvent comprises a compound having the molecular formula:*

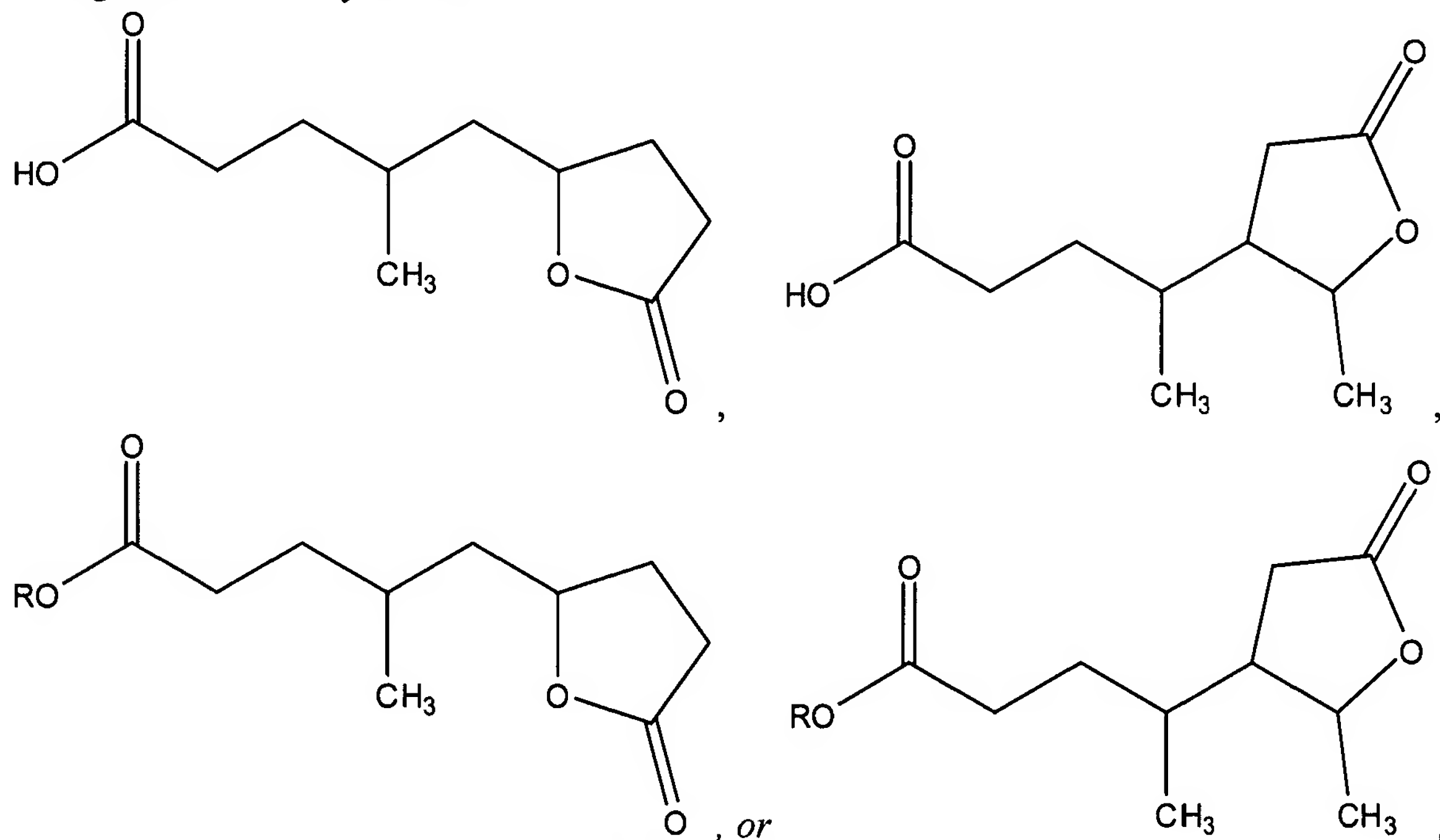


*wherein **R** is C<sub>1-10</sub> alkyl, and wherein the acid catalyst is a strong mineral or organic acid having a pK<sub>a</sub> below 4.7, selected from the group consisting of oxalic acid, 2-oxopropanoic acid, maleic acid, (1E)-prop-1-ene-1,2,3-tricarboxylic acid, 2,3-dihydroxysuccinic acid, furan-2,5-dicarboxylic acid, and combinations of two or more thereof.*

Similarly, claim 15, if re-written in proper independent format to incorporate the limitations of claim 1 and the intervening claims from which it depends, would recite:

*A process for the liquefaction of lignocellulosic or cellulosic material, wherein solid lignocellulosic or cellulosic material is heated at a temperature in the range of from 100 to 300°C in the presence of an acid catalyst and a solvent, wherein the solvent-to-solid material weight ratio is at most 50, the acid catalyst is present in a concentration of at most 50% by*

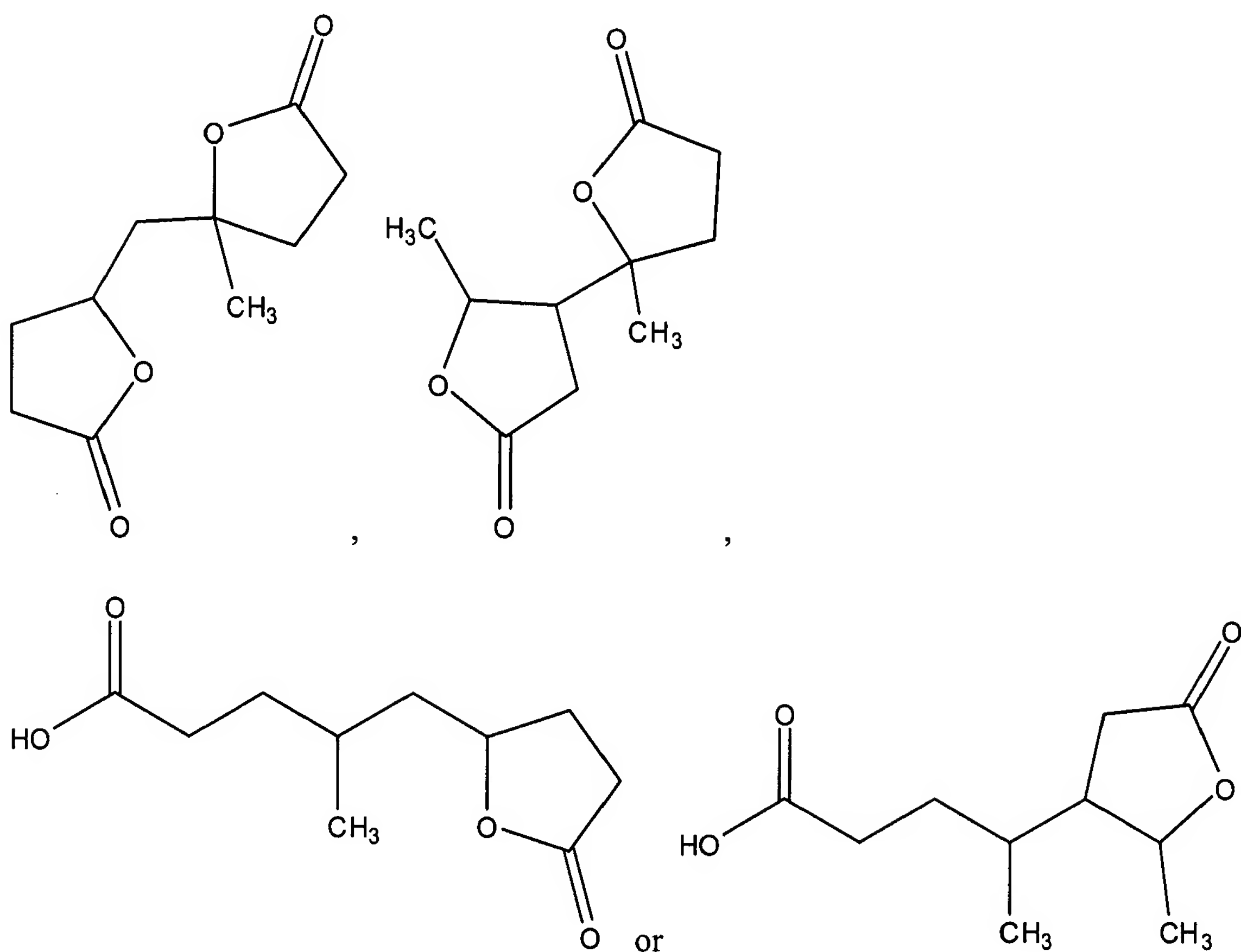
*weight of acid based on the weight of solvent and acid, and the solvent comprises a compound having the molecular formula:*



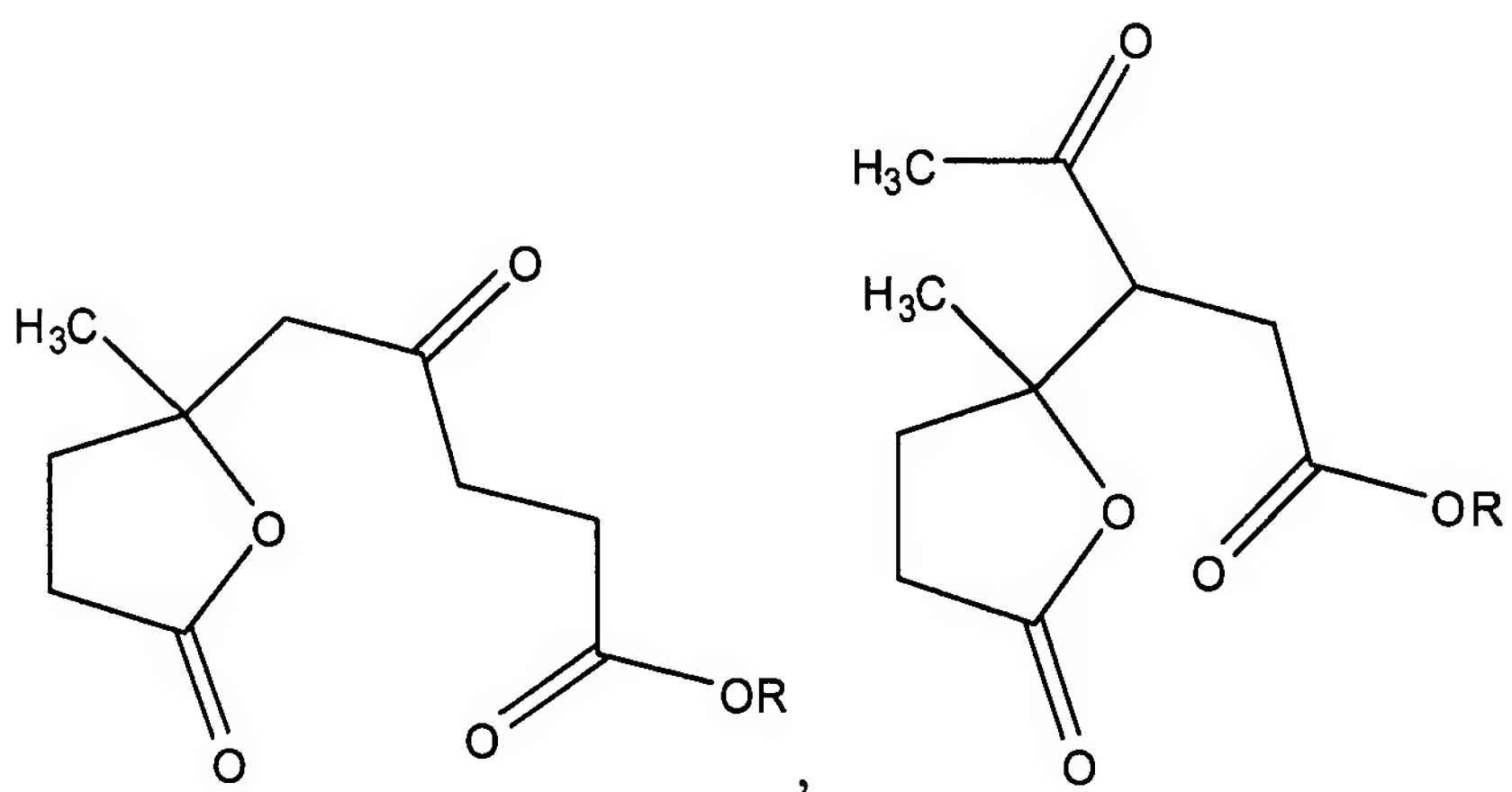
*wherein **R** is  $C_{1-10}$  alkyl, and wherein the acid catalyst is a strong mineral or organic acid having a  $pK_a$  below 4.7, and wherein the solvent-to-solid material weight ratio is in the range of from 3 to 20.*

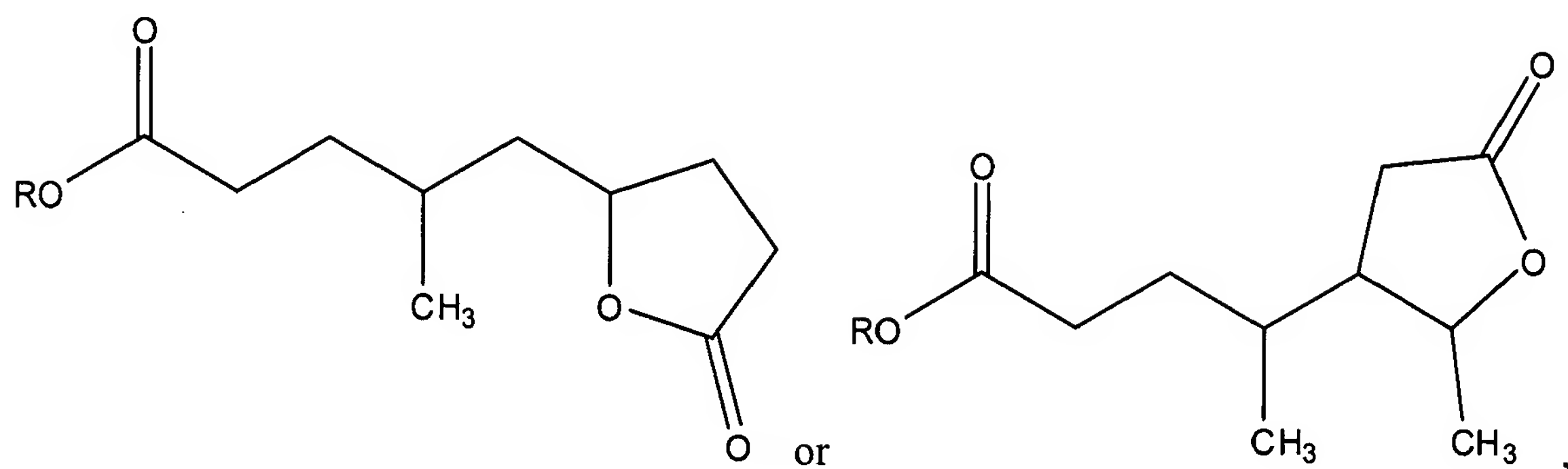
Applicants assert that neither Saya alone, nor the combination of Saya and Robitschek, renders either of these claims legally obvious.

Applicants note that while Saya discloses a number of hydroxyphenyl, polyol, and cyclic esters that can be used in their process, only a *single*  $\gamma$ -lactone, namely  $\gamma$ -valerolactone, is described in Saya. Saya teaches that a variety number of *six-* and *seven-*member ring cyclic esters, as well as beta- and epsilon-lactones can be used in the Saya process, but does not disclose any of the particular five-member ring cyclic compounds taught in the above-captioned application, such as:



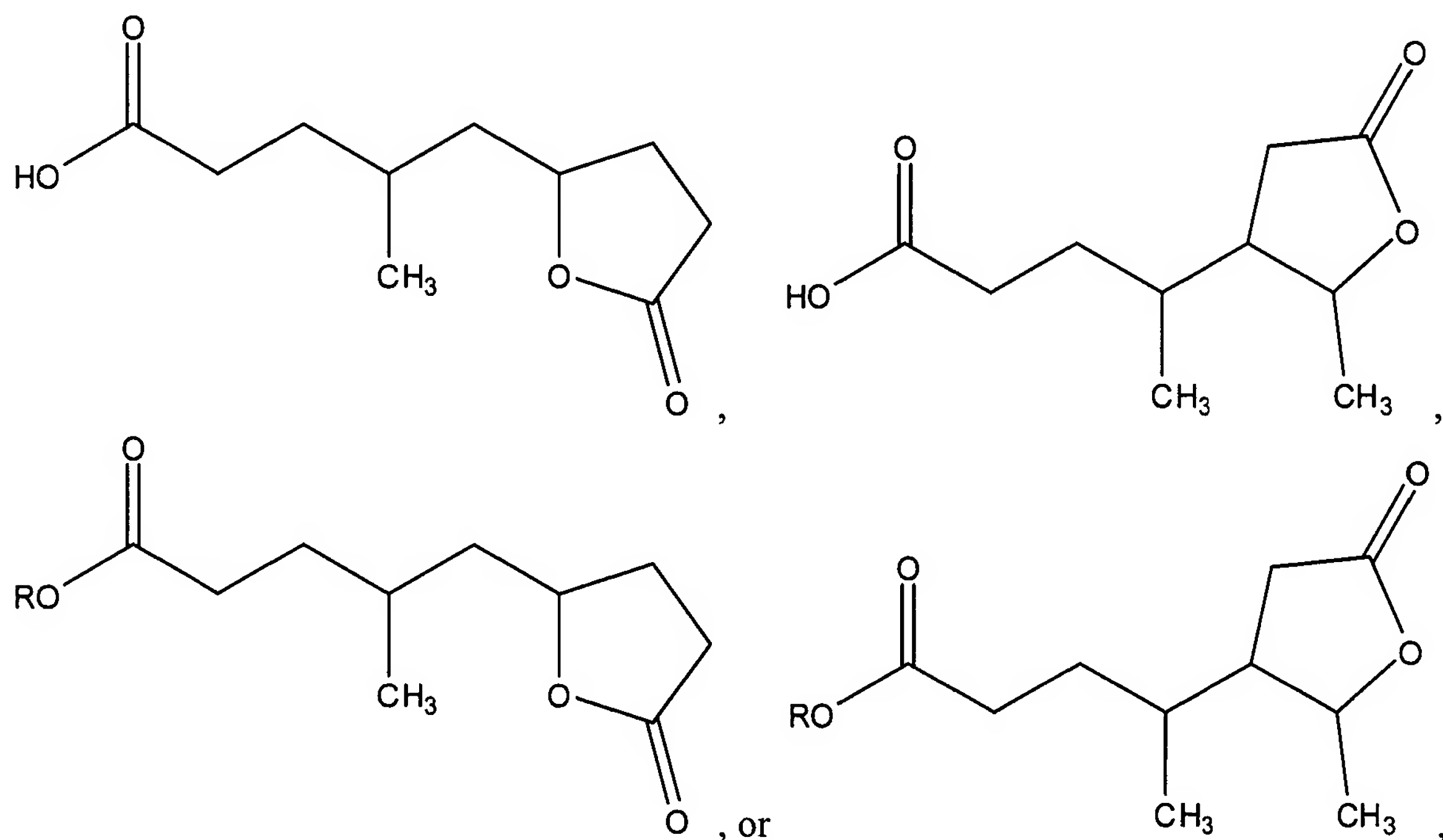
or any ester compounds that have a molecular structure according to any one of the additional molecular formulas disclosed in the above-captioned specification such as :





wherein **R** is C<sub>1-10</sub> alkyl.

Saya does not teach or suggest a process for the liquefaction of lignocellulosic or cellulosic material, wherein solid lignocellulosic or cellulosic material is heated at a temperature in the range of from 100 to 300°C in the presence of an acid catalyst and a solvent, wherein the solvent-to-solid material weight ratio is at most 50, the acid catalyst is present in a concentration of at most 50% by weight of acid based on the weight of solvent and acid, and the solvent comprises a compound having the molecular formula:

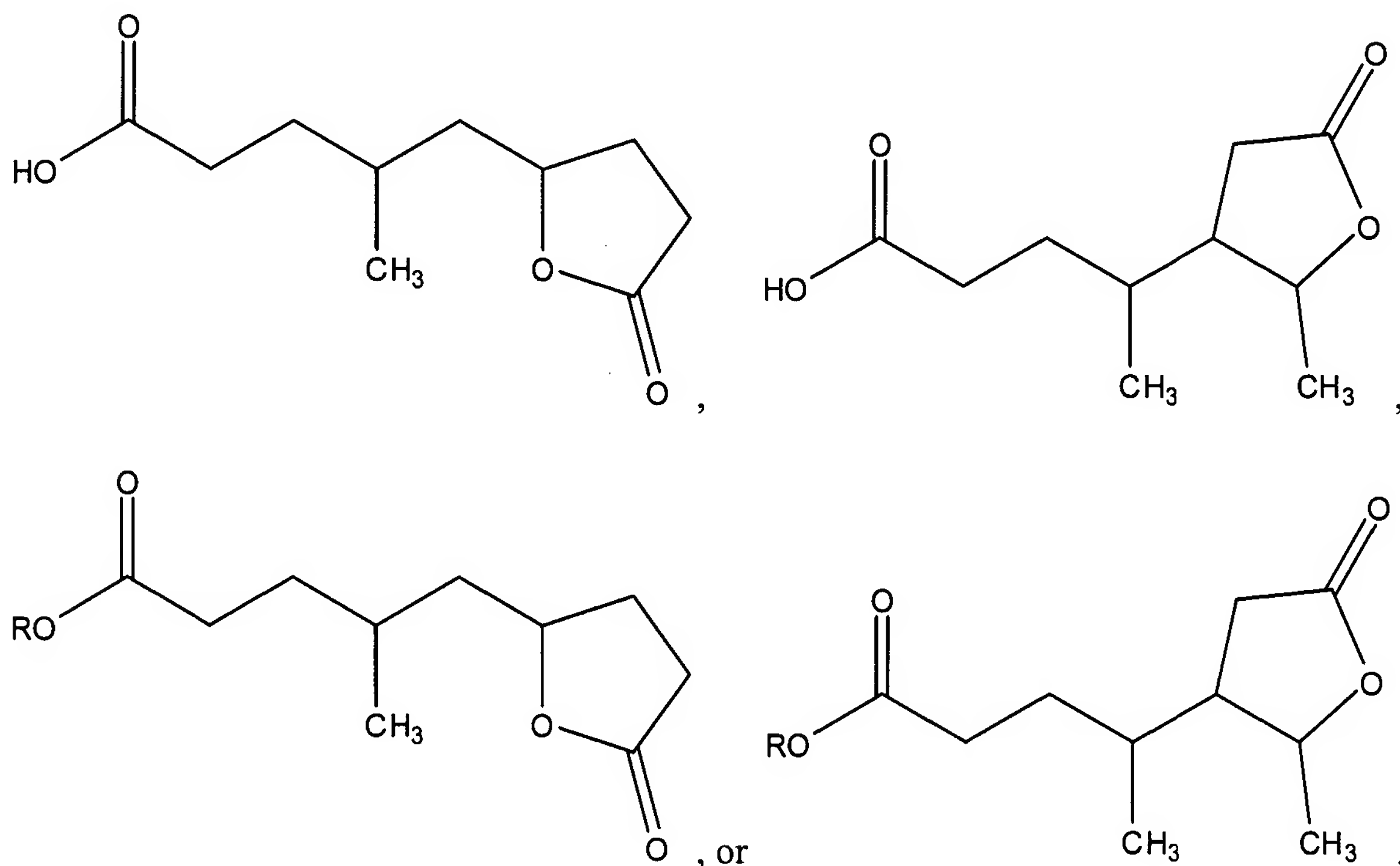


wherein **R** is C<sub>1-10</sub> alkyl, and wherein the acid catalyst is a strong mineral or organic acid



having a pKa below 4.7, selected from the group consisting of oxalic acid, 2-oxopropanoic acid, maleic acid, (1E)-prop-1-ene-1,2,3-tricarboxylic acid, 2,3-dihydroxysuccinic acid, furan-2,5-dicarboxylic acid, and combinations of two or more thereof.

Likewise, the combination of Saya and Robitschek does not teach or suggest a process for the liquefaction of lignocellulosic or cellulosic material, wherein solid lignocellulosic or cellulosic material is heated at a temperature in the range of from 100 to 300°C in the presence of an acid catalyst and a solvent, wherein the solvent-to-solid material weight ratio is at most 50, the acid catalyst is present in a concentration of at most 50% by weight of acid based on the weight of solvent and acid, and the solvent comprises a compound having the molecular formula:



wherein **R** is C<sub>1-10</sub> alkyl, and wherein the acid catalyst is a strong mineral or organic acid having a pKa below 4.7, and wherein the solvent-to-solid material weight ratio is in the range of from 3 to 20.

Therefore, because of the significant differences in the teachings of the cited references compared to the processes set forth in claims 13 and 15, and because neither of the processes in claims 13 and 15 are disclosed or even suggested by Saya and Robitschek, Applicants respectfully request that the rejection over Saya, either alone (claim 15) or in combination with Robitschek (claim 13) now be withdrawn.

## **2.7 PROVISIONAL REQUEST FOR EXAMINER INTERVIEW**

Pursuant to M.P.E.P. §§ 408, 713.01, and 713.09, and 37 C.F.R. § 1.133, should any issues remain in the mind of Examiner Heincer, or should any claims remain rejected for any reason following entry of the present amendment and consideration of the remarks and response herein, Applicants respectfully request that the Office contact the undersigned representative to arrange an Examiner Interview at a mutually convenient time to discuss favorable disposition of the case and the resolution of any remaining issues of record.

Applicants provisionally make this request in order to facilitate an expeditious conclusion of prosecution on the merits in the above-captioned application, and to permit expedited allowance and issuance of the pending claims prior to the issuance of any subsequent action on the merits.

Applicants appreciate in advance the Office's willingness to conduct such an interview, should any issues concerning patentability of the pending claims remain following entry of the present amendment and consideration of the response and remarks submitted herewith.

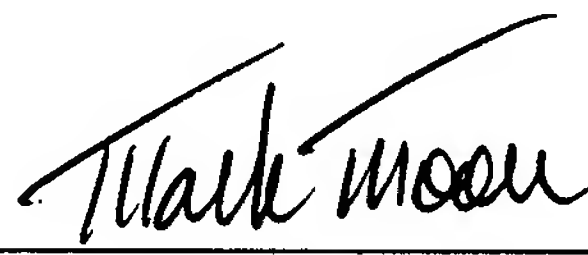
## 2.8 CONCLUSION

It is respectfully submitted that the pending claims are definite, fully enabled, and free of the cited prior art. Applicants believe that the inventions embodied in those claims are useful, novel, and non-obvious. Applicants also note for the record their explicit right to re-file claims to one or more aspects of the invention as originally claimed or disclosed in one or more continuing/divisional application(s), while retaining the priority claim from the above-captioned application and its priority application(s).

Should Examiner Heincer have any questions, a telephone call to the Applicants' undersigned representative would be sincerely appreciated.

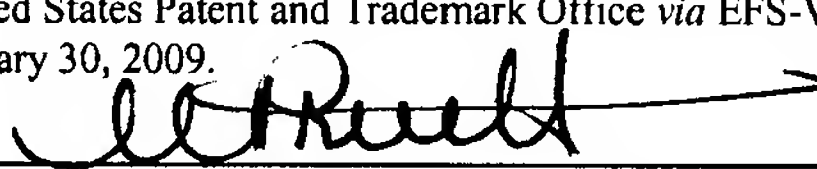
Respectfully submitted,

January 30, 2009  
Date

  
\_\_\_\_\_  
Mark D. Moore, Ph.D. (Reg. No. 42,903)

**HAYNES AND BOONE, LLP**  
**Customer No. 27683**  
Phone: 713-547-2040  
Fax: 214-200-0853

29402.33  
H:765204

<p align="center"><b>Certificate of Service</b></p> <p>I hereby certify that this correspondence is being filed with the United States Patent and Trademark Office <i>via</i> EFS-Web on January 30, 2009.</p> <p align="center"> _____ Margaret A. Pruitt</p>
---